Xinix – Xtreme Water Purifier

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Device Information

The Xinix Xtreme Water Purifier is a dilute chlorine dioxide solution. The device is marketed as a drinking water treatment, wound cleanser, and general sanitary hygiene practices (e.g., washing hands and utensils). The device is a single 5 mL bottle containing a 0.15% chlorine dioxide solution. The device is designed to treat 3 L of water, the size of a typical commercially available individual use water bladder (i.e., hydration system). The manufacturer's directions require the user to add the entire 5 mL bottle into 3 L of water to be treated. This results in an approximate chlorine dioxide dose of 2.5 mg/L. Mix and wait 15 minutes before drinking. Directions also state the water to be treated can be turbid but not dark.

Effectiveness Against Microbial Pathogens

Independent testing using the U.S. Environmental Protection Agency (USEPA) Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 1) confirms this device's ability to consistently provide a 6-log bacteria, 4-log virus, and 3-log *Giardia* cyst reduction when used as directed (reference 2). When used as directed a corresponding disinfectant concentration times contact time (CT) of approximately 38 mg-min/L is provided. Based on the independent testing data using the reference 1 protocol and other chlorine dioxide disinfection studies, the CT provided should consistently provide adequate bacteria, virus, and *Giardia* cyst protection under most any water quality condition expected. The device will not consistently provide 3-log *Cryptosporidium* oocyst reduction when used as directed. Other device-specific testing data that did not use the reference 1 protocol showed the device was not capable of providing a 3-log *Cryptosporidium* oocyst reduction (reference 2). The USEPA proposed significantly higher CTs for a 3-log reduction of *Cryptosporidium* oocysts. For 5° C water, the USEPA recommends a CT of 1286 mg-min/L. These higher CT values are based on numerous chlorine dioxide disinfection experiments and take into account the variability and uncertainty of the data (reference 3). The device can provide protection against *Cryptosporidium* by greatly extending the wait time from 15 minutes to approximately 9 hours or by treating 1 L of water instead of 3 L and extending the wait time from 15 minutes to approximately 3 hours. This results in a CT of 1350 mg-min/L which, according to the USEPA, would ensure a 3-log *Cryptosporidium* reduction at 5° C and above. Waters less than 5° C would require even longer wait times. Based on independent data testing the device under severe conditions required by the USEPA Protocol, the Xinix Xtreme Water Purifier is given three √s for effectiveness against bacteria, viruses, and *Giardia* cysts, and an X for *Cryptosporidium* oocysts (for an explanation of the rating checks click here). The following table summarizes Xinix's Xtreme Water Purifier expected performance, evaluation rating, and the mechanism by which pathogens are reduced:

Table. Expected Performance Against Microbial Pathogens When Used as Directed.

Microbial Pathogen Type	Expected Disinfection Capability	Evaluation Rating	Pathogen Reduction Mechanism
Bacteria	> 6-log	√√√	disinfection
Viruses	> 4-log	√√√	disinfection
Giardia cysts	> 3-log	√√√	disinfection
Cryptosporidium oocysts	Not Effective	X*	-

* Recommend extending the wait time to a minimum of 9 hours to help ensure adequate *Cryptosporidium* oocyst reduction. Or, treat 1 L of water with a minimum wait time of 3 hours. Waters less than 5° C would need an even longer wait time.

Production Capacity

One bottle of Xinix's Xtreme Water Purifier treats 3 liters.

Cleaning, Replacement, End of Life Indicator, Shelf Life

There is no expiration date or production date on the bottle. Based on discussions with the manufacturer, it is recommended that the product be used within 1 year of purchase (i.e., a shelf life of 1 year after), although that information is not provided on the bottle. Information on the bottle indicates the product is active when yellow. This means that the solution is effective when it is colored yellow. When the solution turns clear, there is no longer chlorine dioxide present, thus acting as an end of life indicator.

Weight and Size

The weight of the bottle is approximately 40 grams. The approximate dimensions of the bottle are 5.5 cm long x 2 cm diameter.

Cost

The device cost about $2.00.

Device Evaluation

Independent testing using the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 1) confirms the Xinix Xtreme Water Purifier met the minimum 6-, 4-, and 3-log reductions for bacteria, viruses, and *Giardia* cysts when used as directed (reference 2). This device is not capable of consistently reducing *Cryptosporidium* oocysts when used as directed. Extending the wait time to a minimum of 9 hours or treating 1 L of water with a minimum wait time of 3 hours should ensure adequate *Cryptosporidium* oocyst reduction. Waters colder than 5° C would require even longer wait time. Also, additional treatment such as a 1 µm absolute filter can adequately reduce *Cryptosporidium* oocysts. Since the directions that water to be treated can be turbid but not dark, some user subjectivity is required in the field to make this judgment. The use of chlorine dioxide in water treatment will produce chlorite, a byproduct of chlorine dioxide formed when chlorine dioxide reacts with organic matter in water (reference 4). Chlorine dioxide and chlorite can have serious adverse health effects for children, infants, and fetuses as a result of short-term exposure. But, no adverse health effects are expected for healthy adult individuals using this product for short periods of time and at manufacturer recommended dosages.

Advantages

- Independent testing confirms 6-log bacteria, 4-log virus, and 3-log *Giardia* cyst reduction when used as directed.
- Very small and lightweight.
- Simple and inexpensive to use.
- No adverse health effects expected in healthy adults from short-term use.

Disadvantages

- Not consistently effective against *Cryptosporidium* oocysts when used as directed. Extending wait time up to 9 hours will help ensure adequate *Cryptosporidium* reduction.
- Does not reduce or remove particulate matter.
- Some user subjectivity required.
- May cause adverse health effects in children, infants, and fetuses from short-term use.

References

1. USEPA, Registration Division Office of Pesticide Program, Criteria and Standards Division Office of Drinking Water. (1987). *Guide Standard and Protocol for Testing Microbiological Water Purifiers.* Washington, D.C.

2. Independent testing data provided by Xinix (2001, 2002).

3. Federal Register (2003). *National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule; Proposed Rule.* 68(154), 47640-47795.

4. U.S. Army Center for Health Promotion and Preventive Medicine. (2005). *Technical Information Paper; Chlorine Dioxide Disinfection in the Use of Individual Water Purification Devices,* Aberdeen Proving Ground, MD.